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VEHICULAR CIRCULATION AND PARKING
BOSTON GOVERNMENT CENTER PROJECT
DOWNTOWN NORTH GNRP

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VEHICULAR CIRCULATION AND PARKING

BOSTON DOWNTOWN NORTH GNRP

GOVERNMENT CENTER PROJECT

Prepared for I. M. Pei & Associates, Architects and Planners
By Barton-Aschman Associates, Inc.

June 1961

Scope of Study

The assignment of Barton-Aschman Associates, Inc. has been to appraise in general terms of magnitude and direction both the existing and future requirements of vehicular access to and through the study area. Further, the assignment has involved recommending improvements to the street and highway system, which, on the one hand, seem necessary in light of estimates of future traffic loads, and on the other hand, which are compatible with redevelopment and land use requirements. More specifically, attention has been directed toward these ends:

- To rearrange the pattern of streets in order to more clearly define, make more continuous, and create a more logical and orderly major surface street system.

- To channel traffic into efficient well-designed corridors rather than permitting it to filter through literally all streets in the area.

- To consolidate the street system so as to provide more useable redevelopment sites.

- To establish desirable vehicular, pedestrian, and historical route linkages.

- To establish the proper relationships between land development and street development, not only in terms of location of major streets, but also in regard to local access.

- To suggest improvements for certain problem areas, such as the junction of the Central Artery and the tunnels.

The recommendations contained in this plan have been detailed to the extent necessary to insure their functional and engineering workability, and are presented in such a fashion as to illustrate the principles and concepts involved; this material is not intended to be used as final precise street geometrics for example.

Existing and Future Traffic Flow

The present pattern of streets in the study area leaves much to be desired both in terms of providing for moving traffic flow and service to abutting properties. The pattern consists of too many streets, arranged in virtually no system, having little continuity, with many streets being intolerably narrow. The result of the situation is a flooding of traffic flow, both local and through, over virtually all streets in the area (see Figure 1).

where is it?

In addition to reviewing existing traffic volumes in the area, it is important to consider the desires of traffic approaching and entering the study area. A summary of this data (as shown in Figure 2) is as follows:

- Existing number of person trips to and from the area - 240,000 per day (this amounts to 20% of such trips to and from the entire central area).

- Existing number of vehicle trips to and from the area - 85,000 per day (this equals 36% of the number of person trips).

- Existing person trips to and from the area using mass transit - 115,000 per day (this is 45% to 50% of the total person trips to and from the area).

- Approach routes used by existing vehicle trips: Central Artery (north or south) and Sumner Tunnel - 39%; surface streets (including Storrow Drive) - 61%.

- Existing vehicle trips through the area - 170,000 per day (this is 2/3 of the total vehicles entering the area).

- Future vehicle trips to and through the area - 95,000 to 100,000 per day (this is based on an increase in person trips ranging from 20% to 30%, but with greater use of mass transit, resulting in an increase of vehicle loads of from 12% to 16%.)

- Future vehicle trips through the area - 200,000 per day (this is an 18% to 20% increase over through traffic today).

Some of the more significant conclusions based on the above and other pertinent data are as follows:

- A major portion of both the existing and future "through" traffic represents movements which begin or end in nearby parts of the central area. As such, it is unlikely that these "through" traffic loads can be substantially reduced.

- Traffic flow patterns established by a variety of "given" conditions in or adjacent to the area probably cannot be significantly altered. These "givens" include the Central Artery, both the existing and new tunnels, as well as various surface streets and areas.

- The very heavy concentration of traffic entering and leaving the study area along the east side is pointed up by the existing pattern of traffic flow. This concentration of traffic on the east is due to a variety of

conditions, including the existence of the Central Artery, the existing and proposed tunnels, the connection between Storrow Drive and the Central Artery, and the topography of the area with Beacon Hill serving to further restrict traffic and force it to the east side of the area.

- From existing traffic counts, it is apparent that the Central Artery is attempting to serve three dissimilar (and in some cases, improper) functions; including those of a major access route to the central area, a by-pass through the Central Area and local circulation (short trips along the Central Artery) within the area.

- Even considering the improvement of mass transit facilities and major highway construction outside the central area, the findings of other transportation studies in the area, must be concurred with; mainly the traffic loads into and through the entire central area will increase. These increases will be due not only to increased trip generation by the central area, but also because of the completion of the new tunnel, the probable construction of the turnpike extension or its equivalent, and the completion of additional radial expressways focusing on the central area itself.

Circulation Concepts

In planning streets and highways for this area, vehicular facilities have been classified into one of three types, including limited access expressways, surface arterial routes and local access streets.

As far as expressways are concerned, the only route in this category is the Central Artery connected to Storrow Drive. Circulation plans have been developed which call for minimum changes to the Central Artery and that portion of its ramp system which actually comes into physical contact with the artery.

In order to provide sufficient capacity on surface arterial routes into and through the area, several corridors or channels for the surface system are recommended (as shown in Figure 3). Traffic flow generally in a north-south direction (or in any event passing around the constriction caused by Beacon Hill) would be accommodated in the following corridors:

- Cambridge-Tremont
- Congress-Devonshire-Merrimac-Lowell
- The surface street beneath the Central Artery and connecting to Charlestown Bridge via North Washington Street
- Atlantic and a new connection to Dorchester

In a more or less east-west direction, the following corridors for locating surface arterial routes are recommended:

- Causeway-Commercial
- A pair of one-way streets in the vicinity of Chardon-Sudbury (providing major access and egress for the tunnels and the Central Artery)
- State-Court Streets

Circulation Details

A first step in the designing of general street geometrics is the establishment of traffic volumes which the streets will be called upon to handle (see Figure 4). Given these volumes (covering a period 20 years hence) an appropriate street design criteria including the following preliminary street geometrics can be established. The more important design criteria which have effected street geometrics for this area include:

- Reasonably direct continuous street alignments along the general corridors previously described.

- Streets designed with adequate capacity to serve anticipated volumes and that provide a sufficient number of lanes for moving traffic. (as a general rule, nearly all of the two-way arterial streets in the study area need to be a minimum of six lanes wide. The traffic volumes anticipated on these streets dictate the necessity of the indicated pavement widths. Further, such proper design standards as suggested will allow all of the arterials -- both one-way and two-way routes -- to continue to function with some degree of efficiency even in the event of an occasional stopped -- not parked -- vehicle at the curb, or a left turning vehicle in the middle of the street.

- The proper design of local access points and local intersection spacing along these arterial routes. (Although the arterial streets properly should serve the area in which they are located rather than serve solely as major traffic corridors through the area, nevertheless must be designed to move traffic with ease and efficiency. Ideally, abutting properties should have access only to purely local streets, which, in turn would provide access to the arterial street system carrying traffic to and from the area. Since it is seldom possible, especially in a downtown area such as the study area, to so nicely separate street functions between those of providing access to abutting property and those of efficiently moving traffic, other solutions must be sought. Since the arterial streets in the study area must provide both local access and capacity for moving traffic, certain design criteria should be applied to govern the provision of local access. Incidentally, such criteria should apply to not only private access such as driveways, but also to local public streets and alleys.

(in general, in order to preclude additional turning movements and crossing conflicts near major intersections, vehicular access to abutting properties, either via private driveways or local streets should be eliminated within 150 to 250 feet of such major intersections. Further, local access requirements - either private driveways or local streets - should not be established which necessitate breaking median strips along divided streets such as Cambridge. Suggested locations for local access points -- private driveways and local public streets -- are indicated on the plan of preliminary street geometrics which is discussed more fully in the following and shown in Figure 5.)

A plan of preliminary street geometrics for the entire area is as shown in Figure 5 and includes the following elements:

- Cambridge-Tremont: Although there are some difficulties which effect Cambridge (such as Charles Circle) its existing width approaching the project area makes it one of the more effective surface carriers into and through the area. In addition, Cambridge is of major importance because of its continuity around Beacon Hill and its connections to Tremont Street serving other parts of the downtown area. Cambridge also serves an important role as both the termination of the one-ways (Chardon and Sudbury), leading to and from the tunnels and the Central Artery and a principle access and egress route for state office developments.

  The treatment recommended for Cambridge involves providing a six-lane divided roadway with left turn lanes recessed into the median where required. (In the case of the Sudbury-Cambridge intersection dual left turn lanes for the southbound Cambridge to the eastbound Sudbury are recommended). Southbound Tremont would be fed from Cambridge as it is today through Scollay Square while northbound traffic would enter Cambridge from Court Streetand Washington. (Although in this case, Washington Street is assumed to be a major link feeding traffic to Cambridge. If it were so desired as a part of circulation planning in the downtown retail area, some other route might serve as an alternate for northbound traffic using Washington.) Local intersections and access points (driveways) along Cambridge-Tremont ought to be restricted to the general locations indicated.

- Congress-Devonshire-Merrimac-Lowell: The function of this route is to provide service for and inter-connect the following. Congress and Devonshire Streets in adjacent office areas south of the project area, the government center area, the one-way pair (Chardon-Sudbury) leading to and from the Central Artery and the tunnels. the state campus area, the north station area, the west end project, and finally

Leverett Circle, Storrow Drive and the Charles River Bridge. In addition the route will provide connections with the Charlestown area via Causeway and the Charlestown Bridge. The route is designed to provide up to six moving lanes (three in each direction) with a pavement wide enough to minimize curb interference and also to allow additional left turn lanes where required. At the south end of the project area, the intersection with State Street has been revised and is discussed in the following section. Continuing north on this route, access points and local intersections should be located as generally indicated. Finally, at the north end of this route, new connections between a widened Lowell Street and Leverett Circle have been suggested and are discussed separately.

Congress-State Intersection: The present intersection of Congress-State-Devonshire is extremely awkward for a variety of reasons. First, the number of intersection legs, including Congress to the north, Congress to the south, Devonshire to the north, Devonshire to the south, State to the east and State-Court divided around the Old State House is drastically excessive, with the net result that the pattern of both straight through and turning traffic is highly complicated and disorganized. Second, the existence of the historic building itself, particularly as it protrudes into the alignment of Devonshire results in both a narrowing of Devonshire and a forcing of traffic on Devonshire to jog to the east to get around the building. This is not only awkward but also causes significant hazard and congestion to both vehicles and pedestrian flow in this immediate area. Also of considerable importance is the fact that virtually the entire surface street system north of this point is proposed to be reorganized with arterial traffic consolidated onto a limited number of highly efficient routes, whereas south of State Street the existing, and although more extensive, far less efficient pattern of surface streets is to remain (at least for some time to come). Therefore it is quite important that the movement of traffic between the improved arterial routes to the north and the existing streets to the south be handled as expeditiously as possible; the present design of this intersection makes this difficult.

An intersection design has been suggested (see Figure 5) which allows connections between the new improved two-way Congress north of State and existing two-way Congress south of State as well as to southbound Devonshire. Further, provisions are suggested for the turning movements (especially left turns which cause most congestion) between the new route and State and Court-State Streets. In general, the intersection is designed in such a fashion as to minimize the awkward street pattern created by the historic building which both splits State-Court to the west and causes the abrupt job in Devonshire; this design is achieved only by re-aligning Congress-Devonshire into a more easterly location north of State, as shown.

West End [illegible]

- Leverett Circle: Potential traffic improvements in this area seem to fall into several degrees or levels of action. The highest involves long-range improvements of regional significance. These might include the rearrangement of Leverett Circle, additional grade separations, a new bridge over the Charles River, and/or removal of M.T.A. tracks. More modest improvements affecting the immediate area including the West End Project and the GNRP area constitute a second level of action.

  To the extent that major improvements involve matters which are beyond the scope of this study, it is only the second (or interim) level of improvements which have been considered. The function of Leverett Circle is to serve as a junction point for four arteries of the street and highway system. These include Storrow Drive to the southwest, Charles River Dam to the northwest, ramps to and from the Central Artery, and Lowell Street (and/or Nashua) to the southeast. Analysis of existing traffic flow indicates that movements between Storrow Drive and the Central Artery ramps constitute by far the heaviest volumes through the circle area.

  It is also important to evaluate the function of Lowell and/or Nashua southeast of Leverett Circle. First, these streets will serve as an important link to the improved and relocated Merrimac-Congress route into the government center area. Secondarily, Lowell and/or Nashua will intersect and feed traffic to Causeway and Staniford.

  There are a number of interim solutions possible for this area; the scheme suggested in this study involves widening Lowell south of Minot Street, changing the direction of the existing connection between Leverett Circle and Lowell from southbound to northbound and constructing a new southbound connection between the circle and Lowell. Other possibilities would involve the use of existing Lowell and Nashua as a one-way pair to and from Leverett Circle with these two streets brought back together and to improve Lowell somewhere south of Minot Street. It is pointed out in previous studies, however, the only real requirements of the GNRP circulation system is the maintenance of an efficient connection between Leverett Circle and the proposed Congress-Merrimac route.

- Washington-Surface Street Beneath Central Artery; also Central Artery, Tunnel Surface Street Interchange Area: The various facilities are so closely inter-related that they cannot be discussed separately. Also, because of the complexities of existing ramps, new ramps, elevated roadways, etc. Figure 6 has been prepared in order to illustrate and tabulate the various proposed improvements and their functions in this area. Briefly, modifications to this portion of the roadway network are suggested in order to (1) provide a new continuous arterial

street composed of Washington Street from the north, new elevated and ground level connection in the vicinity of the tunnels, in the existing surface street beneath the Central Artery south of the tunnels, and (2) improve the facilities for interchange between the Central Artery, tunnel system and surface streets leading to and from the government center area.

Commercial-Atlantic-Dorchester: The existing function of Atlantic-Commercial Street is one of an intensively developed industrial-commercial trucking street. This is indicated by the existing frontage uses along the street, adjacent truck docks, the railroad tracks within the right-of-way and the character of moving traffic on the street. Atlantic-Commercial carries about 8,000 to 10,000 vehicles per day with trucks accounting for 40% to 60% of this flow during much of the mid-day period (although truck dloads are considerably less during periods of peak traffic flow).

The traffic functions of the route include the following: Atlantic and Commercial serve as approach and local access routes for a considerable number of trucks destined along the street; to a significant extent, through trucks between Charlestown and points south and east of the study area use this route; because of the location and design of the Central Artery as well as its interchange with the Sumner Tunnel, Atlantic-Commercial is of considerable importance in providing access to North End residential areas and other locations lying east of the Central Artery; especially during rush hours a number of autos use Atlantic-Commercial as a by-pass route around more congested parts of the Central Area.

Two factors will have a major effect on the future of Atlantic-Commercial. First, the proposed redevelopment of commercial uses along this street with these uses to be replaced by residential development. Specialized retail shopping and specialized office development will obviously effect both the character and magnitude of traffic flow on this street. Second, a proposed connection between Atlantic-Commercial and Dorchester Avenue will similarly affect traffic flow. Based on this new land development, Atlantic-Commercial will perform only two essential functions in the future. These include continuing to provide access to the area east of the Central Artery and along the street itself, and serving as an important auto by-pass route. Although estimated traffic loads will increase along the street, the character of this traffic stream will be considerably different from what it is today. Through trucks would be diverted to the improved surface arterial street running beneath the Central Artery and connecting directly to Washington Street North and the Charlestown Bridge. With the elimination of commercial truck generators along the street, there would no longer be any extensive local trucking. The resulting reduction in both through and local trucking movements would thus

allow Atlantic-Commercial to function basically as an auto route (although it must be emphasized that it would be an auto route of some importance, especially during rush hours when vehicles were seeking to by-pass more congested parts of the central area).

Under the conditions just described, it would seem that the route could be suitably "dressed up" in order to be aesthetically compatible with adjacent new land developments. The cross-section of the street should desirably provide for up to six moving traffic lanes with a fairly wide median strip possibly added for not only aesthetic reasons but also to provide recessed left turn lanes.

Causeway-Staniford: The principle function of this route is to allow interchange between the various north-south arterial routes through the study area. Most importantly, Causeway will provide a connection between new Congress-Merrimac-Lowell and the Charlestown Bridge. Causeway-Staniford will also connect Commercial on the east and Cambridge on the west. Further, this route serves as an important access and collector street for the North Station Area, the State Campus Area and the West End Project. Finally, the route also serves traffic destined to and from the Central Artery to the south via the ramps at Causeway.

Traffic demands at this route are such that four moving lanes will adeautely serve.

Chardon-Sudbury One-way Pair: These two streets are intended to serve as the principle routes between Government Center area and the Central Artery and tunnel system. To a considerable extent the routes will similarly provide for movements between other parts of the study area in downtown Boston and the Central Artery-Tunnel Interchange area. New Chardon-Sudbury will replace the Dock Square and Haymarket Square access and egress to the Central Artery-Tunnel Interchange area.

These routes are intended as very high capacity surface carriers. As such, they must provide for four, and in some cases five, moving lanes on each of the two streets. Further, efficient, highly channelized intersections allowing for turning movements to and from the one-way pair are suggested at Congress-Merrimac and at Cambridge.

State-Court: The function of State Street, both today and in the future, is partly that of a surface arterial street in the downtown area, and partly that of providing access to abutting properties. In its role as a surface arterial, State Street serves only as one element of the complete system of routes; it is and will continue to be only one of

several east-west downtown surface streets, which is relatively continuous between the various parts of downtown and leading toward the Central Artery. State Street will provide access mainly to just that part of the Central Artery which includes south portions of Government Center and north sections of the financial-office district.

Although State Street is a part of the surface arterial street system, compared with other routes in the system, its anticipated volumes will be relatively low. (Traffic loads along State will be at their maximum in the vicinity of the Central Artery; east of this point as well as further west along the street, near and beyond Congress-Devonshire, volumes will be somewhat lower).

Ultimately, the street should be widened to provide two-way movement and a total of four moving lanes. Therefore, although the existing street width is retained, future building set-back lines are suggested in order to allow for this ultimate widening.

As an aid in determining circulation requirements for the Government Center portion of the study area, special analysis of signal requirements has been undertaken for this portion of the project. Recommendations are made (see attached table) concerning signal locations, signal phasing, and interconnection between signalized intersections.

Parking Recommendations:

Allied with circulation planning is the provision of parking, particularly in a terminal area such as Government Center. Obviously, the use of mass transit must also be considered in establishing parking needs.

Plans for renewing the central areas of most metropolitan cities generally display a consistent philosophy in dealing with problems of transportation. They recognize that the total denial of accessibility by automobile to facilities comprising the central area is impractical and may be incompatible with the entire rehabilitation process. On the other hand, it is agreed that full and unrestricted access by auto is contrary to achieving a well-designed, efficient central area.

Excessive moving vehicle loads, vehicle-pedestrian conflicts, and virtually impossible vehicle storage problems would all be the result of over-use of the private auto as a means of access to the central area. Therefore, in designing transportation facilities, including facilities not only for movement but terminals (parking) as well, care has been taken not to induce excessive travel to and within the central area by private automobiles.

In Boston, there always has been a severe limitation on the capacity of the street system. Existing surface streets are narrow and generally lack continuity; the newer expressways have been quickly loaded to capacity, with resulting

congestion. If, in the rebuilding process in Central Boston, an overly excessive amount of parking is provided, even more traffic will be induced to use the street and highway system. This would result in even greater congestion, not only on existing surface streets but also on proposed improved streets as well as on new highway facilities. The concept of providing such extensive parking and consequently of requiring even more expensive street and highway improvements is far less economical than the concept of making maximum use of public transit facilities.

A principle value of a central location for commercial, institutional or governmental functions is the high accessibility of such a location to the maximum number of people. The most feasible circulation of large masses of people between the functions comprising the Government Center Area and between Government Center and other parts of Downtown Boston is either on foot or by means of public transportation. If such local internal circulation is to be both practical and pleasant, the interferences due to private vehicles should be held to a minimum through the basic design of the circulation system. To the extent that autos, rather than public transit facilities, are used for access, the autos ideally should be intercepted first at parking fields on the terminal points of the M.T.A., and seconly, those that penetrate closer to the center should be held at the perimeter of Downtown Boston or at least at the borders of the functional districts (such as Government Center) comprising the entire area. The means for accomplishing this are large perimeter parking facilities which have the best possible connections to the major streets and expressways leading into the district. Those parking facilities which are distributed within the central area and its functional districts should be limited in capacity and restricted to short time, high-turnover use by patrons and visitors rather than by employees.

In general, parking for non-residential portions of the GNRP area should be established in accordance with the preceding philosophy: It should be based on a continued expanded use of public transit; it should be concentrated at the periphery of the sub-areas within the study area and as near as possible to major incoming highway facilities; some lesser amounts of parking for very short time, high-turnover use may be incorporated within the various areas.

More detailed recommendations have been prepared for the Government Center portion of the study area. (See Figure 7.) It is estimated that 50,000 to 55,000 persons (visitors and employees) will come to the Government Center area daily. Available studies in Boston indicate that only about 15% of the anticipated employees will drive autos to work, however visitors will use autos more extensively, with approximately 40% driving to the area. Therefore, future total vehicle movements into the area will be about 16,500 per day. (This total vehicle load must be adjusted, however, in order to eliminate both commercial vehicles which do not require parking facilities, and autos which are either destined or parked within the general Government Center area but outside of the specific renewal project limits; the resulting quantity of autos is approximately 11,000 vehicles per day.)

To accommodate the private autos destined each day to the Government Center area, up to 4,900 parking spaces are suggested (3,900 spaces within the technical limits of the renewal project area -- See figure 7). Although this indicates a turnover rate which is relatively high for an office building area, in this case, since for the most part, government offices are involved, such a high rate of use (1.2 per day for employees; 4.0 to 4.5 per day for visitors) seems to be valid.

Staging of Street Improvements in Government Center Area

With the exception of the Central Artery-Tunnel Interchange area, the relationship between the street system for Government Center area with adjacent existing streets presents no special problem. (In some cases, these relationships have already been discussed in the preceding material.)

In the case of connecting Government Center streets to the Central Artery-Tunnel Interchange area, special interim provisions will have to be made prior to completing the recommended modifications to the Central Artery-Tunnel Interchange (see Figure 8). The changes in this area which should be made for this interim period involve only relatively minor adjustments to surface channelization under the Central Artery itself so as to provide proper connections to and from a proposed Chardon-Sudbury one-way couple.

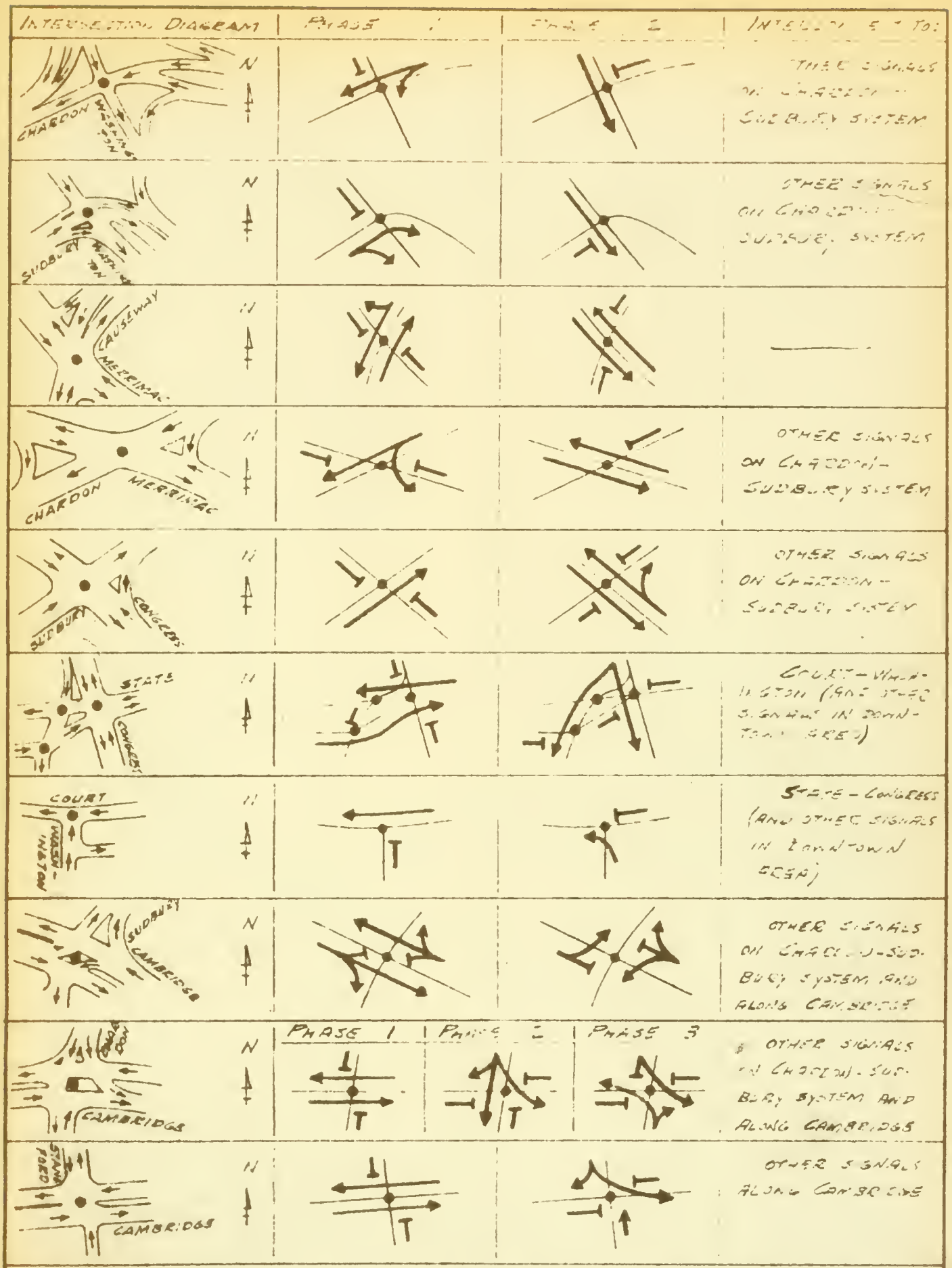
During this interim period, traffic will also continue to approach the tunnels and the Central Artery via North Street, although North Street should provide for only one-way eastbound flow.

Classification of Traffic Using Ramp Facilities in the Vicinity of the Central Artery and The Tunnels

The following sketch has been prepared to show anticipated traffic volumes on roadways and ramps in the vicinity of the Central Artery and the existing and new tunnels. The sketch covers the area generally from New Chardon Street south to State Street.

The future volumes are classified as to total daily traffic flow, daily flow to or from the Government Center area, daily flow to or from the remainder of the GNRP area and remaining traffic (moving through the study area).

It is intended that these figures help to determine the degree of benefit which recommended ramp and roadway changes would have as far as the Government Center area and the GNRP area are concerned.



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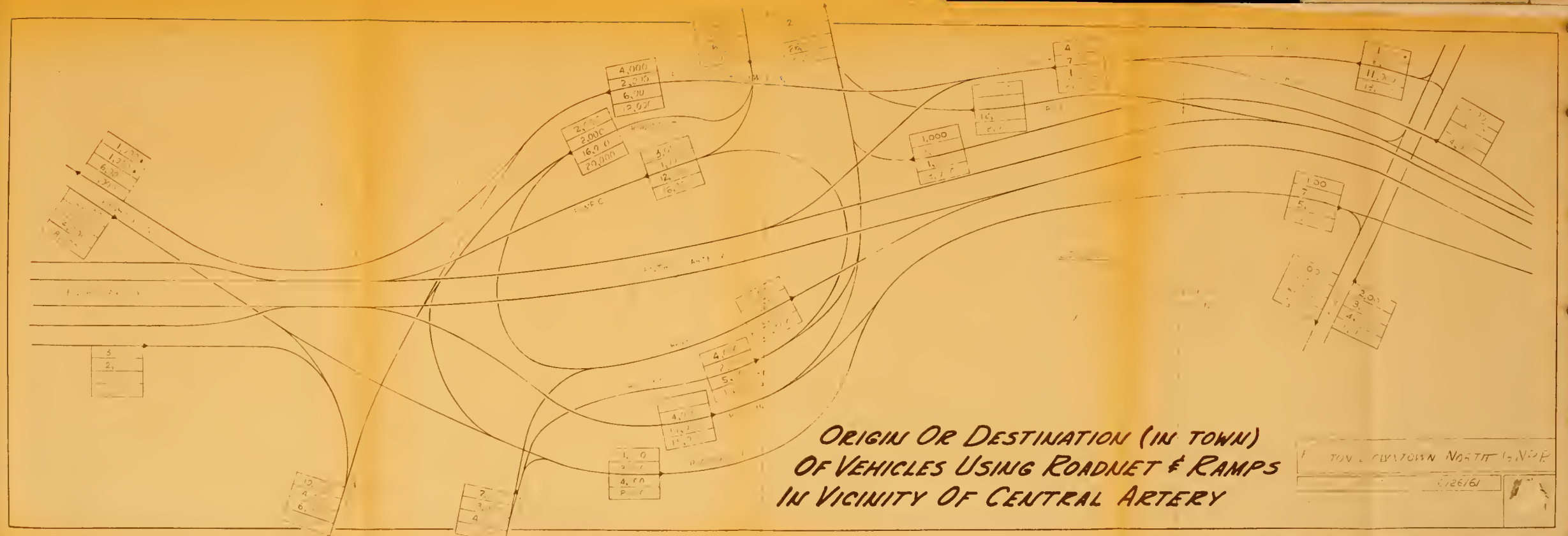
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